

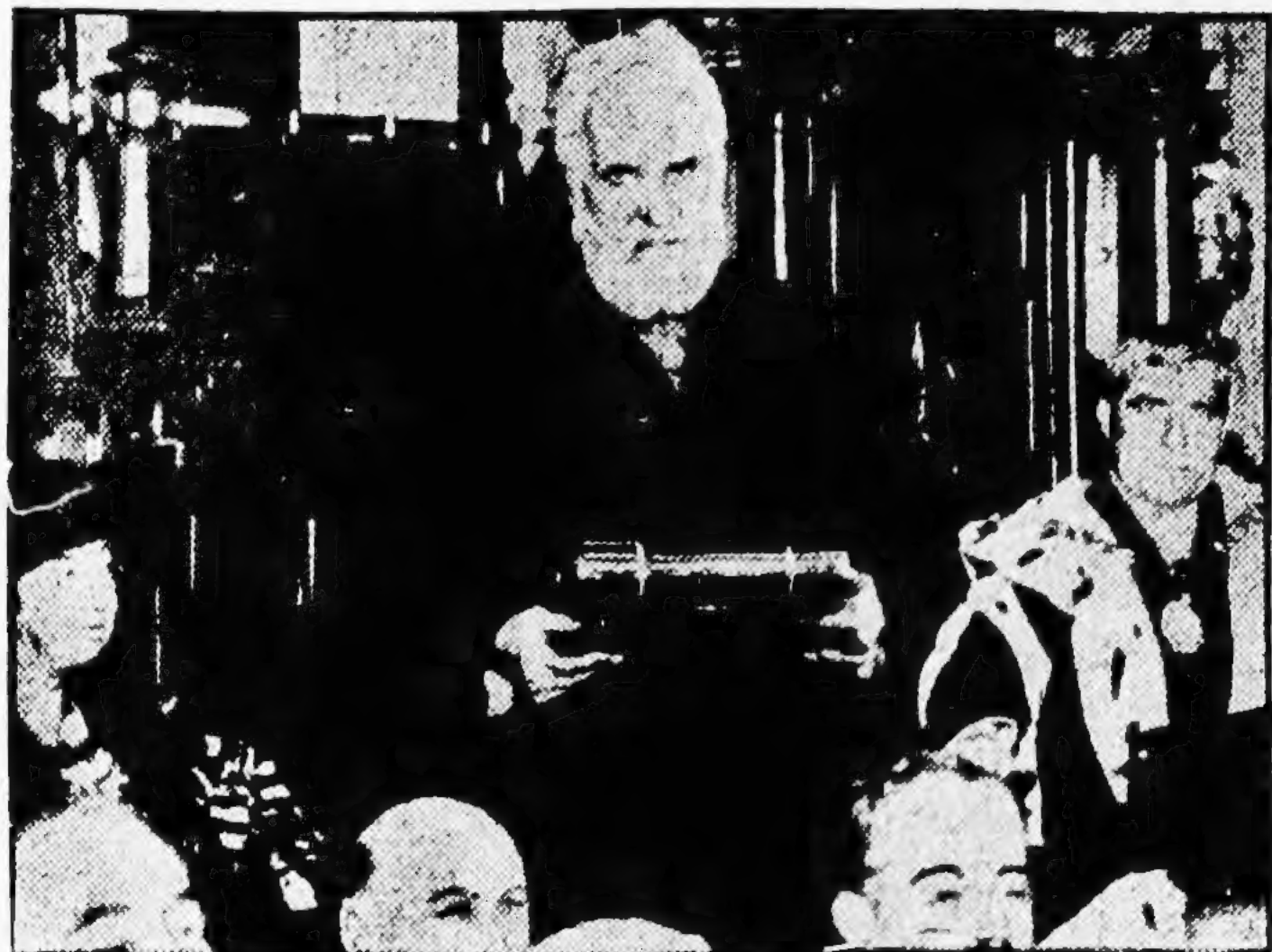
# Incidents In The Life Of The Late Dr. Alexander Graham Bell



FATHER AND SON—(Left) Alexander Melville Bell, father of (right) Dr. Alexander Graham Bell.



BEINN BHREAGH—The late Dr. Alexander Graham Bell's beautiful summer home at Baddeck, Cape Breton. It was on this estate, overlooking the Bras d'Or Lakes, that Dr. Bell pursued many of his experiments of recent years.



DR. BELL receiving the freedom of his native city of Edinburgh, on the occasion of his return on a visit fifty years after making his home in the New World.

## Prehistoric Telephone Days

An Autobiography of the Great Inventor,  
Published Shortly Before His Death

THE following article on "Prehistoric Telephone Days," written by Dr. Alexander Graham Bell, was published this year, and forms a remarkable and intimate history of the life-work of the great inventor who died yesterday:

I WAS over in England the other day and was rather startled and amused by some of the greetings I received while there. Upon one occasion I was introduced to a lady as "the inventor of the telephone," and what do you think she replied? "Well Mr. Bell, she said, 'I thought you were dead long ago!'"

Well, I am not dead yet; and I can assure you that it gives me great pleasure to be able to be with you today and meet the Commissioner and the ladies and gentlemen connected with the Patent Office.

I have been thinking a good deal about what I could say to you here. Of course, you expect me to say something about the telephone, but I rather think that you know more about the telephone today than I do.

When I heard the Commissioner remark that there had been more than 8,000 patents granted in the telephone department, and thought of the multitude of interferences that must have arisen, and the thorough way in which you must have examined into the past history of the art, I came to the conclusion that there was not much use in my telling the examiners of the Patent Office anything about the history of the telephone; you are familiar with it already.

My only hope of telling you anything you don't know is to give you a few personal reminiscences concerning what we might term "Prehistoric Telephone Days." Here I have a clear field to myself, for there are certainly few, if any, persons now living who are competent to speak of my boyhood and the various influences, hereditary and environmental, that moulded my early life and led me onward irresistibly in the direction of the telephone.

Here I am afraid I will have to go back to my grandfather, Alexander Bell of London, England (1790-1865).

He was an elocutionist and a corrector of defective utterance. He was the first in the family to take up the study of the mechanism of speech with the object in correcting defects of speech by explaining to his pupils the correct positions of the vocal organs in uttering the sounds that were defective.

### EARLY EDUCATION.

MY early boyhood was spent in Edinburgh, but when nearly fifteen years of age I went to London and stayed for a year with my grandfather. I had there no young companions of my own age, and this year spent alone with the old man had a profound influence upon my whole future life.

My grandfather took a great deal of interest in my education. My school life had been characterized by great indifference to the usual school studies and I took a very low rank in my classes. The subjects in which I really excelled, such as music, botany and natural history, formed no part of the school curriculum. For Latin and Greek I felt no taste. Geography, too, I found dry and uninteresting.

In arithmetic alone I think I took an average stand. My knowledge of the processes of arithmetic was fairly good, but I failed sadly in the execution. In exercises in proportion, for example, I found little difficulty in stating the proportion correctly, but could rarely work out the correct answer, on account of the mistakes in addition, subtraction, multiplication and division.

My poor standing in school was, I think, the result of lack of ambition rather than of real lack of ability, for I excelled in the unusual studies I pursued out of school hours and in which I took a real interest.

### MUSIC WAS AN EARLY PASSION

MUSIC especially was my earliest hobby. I learned to play the piano at such an early age that I have no recollection now of a time when I could not play. I seem to have picked it up by myself without any special instruction and although I knew nothing

of written music, I could play anything I heard by ear and could improvise at the piano for any length of time.

Of course, it is difficult for me now to form any true estimate as to what my real abilities were in this direction as a little child, but some circumstances seem to indicate that they must have been exceptional.

A distinguished professor of music, Signor Auguste Benoit Bertini, heard me improvising at the piano, and when he found that I had received no instruction in music and knew nothing of notes, he adopted me as a musical protegee. For some months he gave me instruction in his system of reading music at sight.

He was then an old man and did not live long. I have a faint recollection of my last interview with him, when he presented me with everything necessary to teach his system of music and expressed the hope that when I grew up to be a man I would not let him be forgotten. After his death I received no further formal instruction in music excepting from my mother, who sought to carry out Bertini's ideas as well as she could.

It is rather a curious fact that the moment I learned to read music from notes I gradually lost the faculty of playing by ear.

The promise of my early childhood in the musical direction did not materialize and although during the whole of my boyhood my great ambition was to become a musician, I gave up music when I entered upon the work of teaching the deaf.

I am inclined to think, however, that my early passion for music had a good deal to do in preparing me for the scientific study of sound.

### NATURE STUDY

AS a child, I took a great deal of interest in flowers and plants and formed a large herbarium, arranged according to the Linnean system of botany.

I am inclined to think now that I must have had assistance, probably from my father, in studying botany. It is very unlikely that a little child could take it up by himself. My collection of plants gradually gave way to collections of shells and birds' eggs. Then came butterflies and beetles and finally the skeletons of small animals, like frogs and toads, mice and rats.

On one occasion my father presented me with a dead sucking pig and the "distinguished professor of anatomy" was called upon for a lecture. So a special meeting of "The Society for the Promotion of Fine Arts among Boys" was held in my study, the attic of my father's house (13 South Charlotte street, Edinburgh). This was sacred to me and there my collections presented an imposing array of anatomical specimens.

Some boards were arranged as seats for the members of the society. On a table in the middle lay the defunct sucking pig. It was a great moment when I started to thrust my knife into the abdomen of the subject for dissection. But, unfortunately, there happened to be some air in the creature, so that the knife thrust was followed by a rumbling sound that resembled a groan, with the result that we thought the creature alive.

Horror-stricken, I rushed from the room followed by all the boys. We tumbled over one another to get downstairs. Each boy fled to his home, and none returned to hear the lecture. Even the lecturer himself was too frightened to revisit the lecture hall. My father was obliged to go upstairs and take charge of the corpse; I never saw it again.

Urged by curiosity, I was very fond of opening the bodies of small animals to see what they were like inside. I had a large collection of little skeletons, nicely arranged and classified as in a museum. I also had a good collection of the skulls of the "higher mammals" (squirrels and rabbits), even including the heads of "carnivora" (cats and dogs); but the gem of the whole collection was a real human skull, presented to me by my father.

I can see in these natural-history collections a preparation for scientific work. The collection of material involved the close observation of the likenesses and differences of objects of very



"MUSIC WAS MY EARLIEST HOBBY."

similar kind, and the orderly arrangement, as in a museum, stimulated the formation of generalizations of various kinds.

My father encouraged me in making collections of all sorts and in arranging the specimens in accordance with my own ideas rather than in conformity with the ideas of others. I am inclined to think that the making of these collections formed an important part of my education and was responsible for my early bent toward scientific pursuits.

### LIFE WITH MY GRANDFATHER

HOWEVER much I may have excelled in these exceptional pursuits, my grandfather made me speedily realize that I was grossly ignorant of the ordinary subjects of study that every school boy should know. He made me ashamed of this ignorance and aroused in me the ambition to remedy my defects of education by personal study. He helped me to map out my time and devote certain hours to the ordinary school subjects. He also gave me personal lessons in elocution and English literature.

My grandfather was well known as a Shakespearean scholar and a public reader of Shakespeare's plays; so, of course, I had to make myself familiar with the plays of Shakespeare and commit to memory long passages from "Hamlet," "Macbeth," "Julius Caesar," and "The Merchant of Venice."

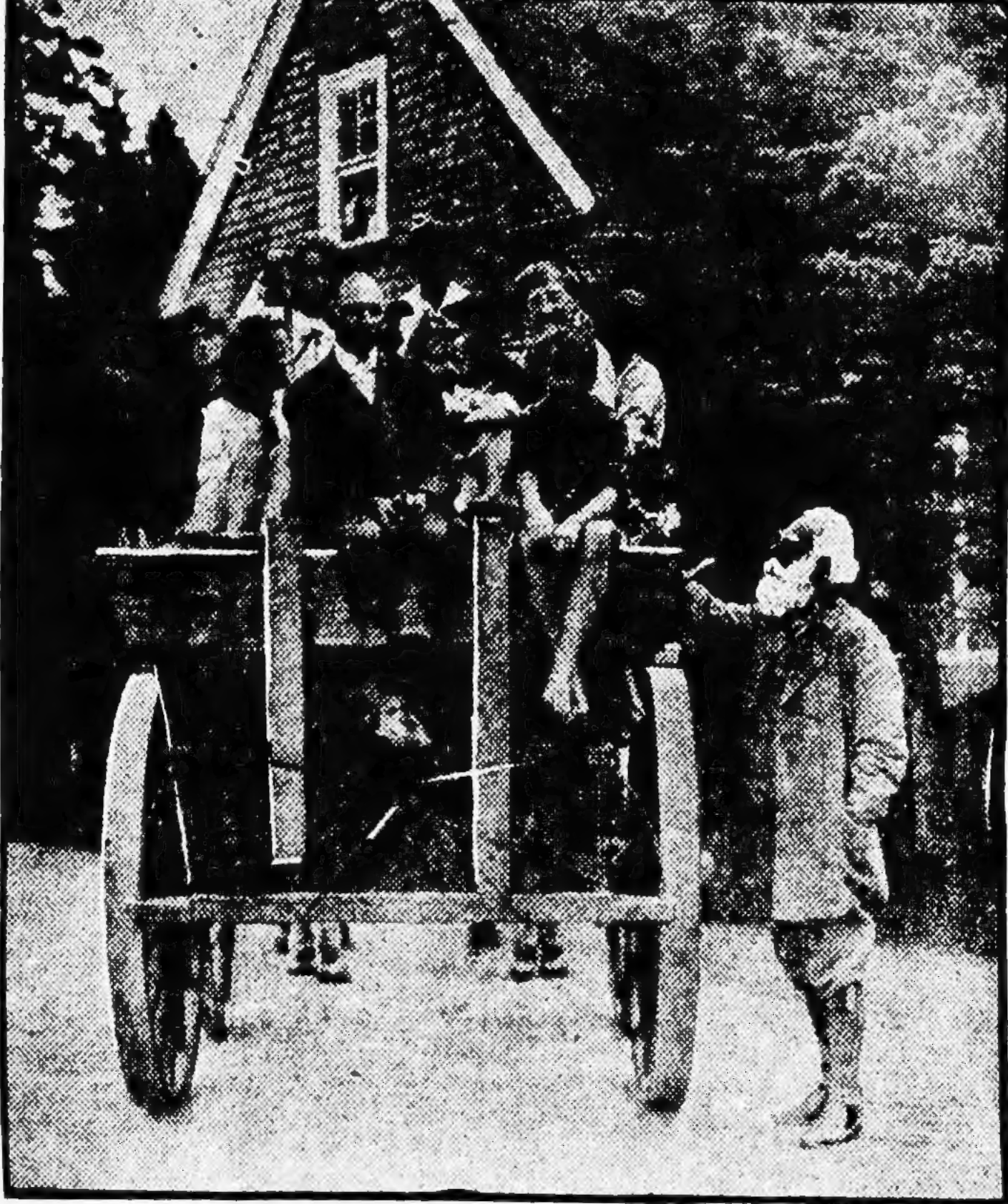
He also gave me instruction in the mechanism of speech and permitted me to be present at the instruction of some of his pupils, so that I might observe for myself his methods of correcting defective utterance.

This year with my grandfather converted me from an ignorant and careless boy into a rather studious youth, anxious to improve his educational standing by his own exertions and fit himself for college.

I have found it necessary to allude to my grandfather, and to his work in correcting defective utterance, not only on account of the influence he exerted upon my own life, but because the profession he founded became in process of time a family profession, which was handed down to his children and grandchildren. His two sons, for example, followed it.

His oldest son, David Charles Bell, of Dublin, Ireland (1817-1902), was an elocutionist and corrector of defective utterance. He was the father, by the way, of Mr. Charles J. Bell, of Washington, President of the American Security & Trust Co.

His other son, my father, Alexander Melville Bell, of Edinburgh, Scotland (1819-1905) was also an elocutionist and corrector of defective utterance. He, however, branched off in a new direction, as an inventor. He devised a remarkable system of symbols for depicting the actions of the vocal organs in uttering sounds. These symbols could be used in printed form, like letters of the alphabet. He claimed, indeed, that what he had really invented was a universal alphabet, capable of expressing the sounds of all languages in a single alphabet, and that his letters, instead of being arbitrary characters, were symbolic representations of the organs of speech and of the



DR. AND MRS. BELL and some of their grandchildren and friends starting out on an unconventional drive along the Bras d'Or Lakes.

way in which they were put together in uttering sounds.

### THE MELVILLE BELL SYMBOLS

FOR example, let me give you an illustration. The symbol for what we would call the letter M consisted of a curve forming the outline of a human lip, combined with another symbol meaning that the two lips were shut together. Then there was a third symbol, indicating the vibration of the vocal chords in forming voice; and still a fourth, showing that the soft palate was depressed so as to open the entrance into the nasal passages.

These four symbols were combined into a single character reminding one of some strange letter in a foreign language; but unlike any such letter, it was not necessary for you to hear the sound in order to reproduce it.

The symbol could be analyzed into a direction to do something with the mouth, and if you followed the direction you uttered the sound, even though you had never heard it before.

The symbol for M could thus be translated into a direction to "shut your lips and pass voice through the nose." Now you will see, if you shut your lips and pass voice through the nose, you get one sound only, the sound of the letter M.

I remember my father giving a public lecture upon his system of Universal Alphabets when I was a boy, and I acted as his assistant upon the occasion.

I was sent out of the hall, and then the members of the audience were invited to make any sort of sound they desired, to be symbolized by my father. It was just as easy for him to spell the sound of a cough, or a sneeze, or a click to a horse, as a sound that formed an element of human speech.

Volunteers were called to the platform, where they uttered the most weird and uncanny noises, while my father studied their mouths and attempted to express in symbols the actions of the vocal organs he had observed.

I was then called in, and the symbols were presented to me to interpret; and I could read in each symbol a direction to do something with my mouth.

I remember upon one occasion the attempt to follow directions resulted in a curious rasping noise that was utterly unintelligible to me. The audience, however, at once responded with loud applause. They recognized it as an imitation of the noise of sawing wood, which had been given by an amateur ventriloquist as a test.

I remember another still more remarkable test. My father handed me a piece of paper with a very simple-looking symbol upon it, and I was requested to utter the sound represented.

At first I thought it was simply the direction to pronounce the letter T, but soon noted a little diacritical mark attached to the

symbol that had the technical meaning of "soft palate."

This I translated to mean that the point of the tongue, instead of being applied to the upper gum, as in the ordinary method of forming T, was to be coiled back in the mouth and placed against the soft palate—a thing I had never heard of or dreamed about before.

I followed the direction, coiled my tongue backward and tried to make a T-sound, with the point of the tongue against the soft palate. This resulted in a sound resembling both K and T, and the gentleman who had given the test expressed great satisfaction. He informed the audience that he was a professor of Hindustani, employed by the Indian Civil Service to teach young men Sanskrit and the language of India. The sound he had given was the "Sanskrit cerebral T." He had been very unsuccessful, he said, in getting English students to master this sound and expressed surprise that Mr. Bell's son should have given it correctly at the very first trial, without ever having heard the sound at all.

SUCH incidents as these led my father to predict that persons who were born deaf might, through the use of his symbols, be taught to use their vocal organs and speak, instead of being limited in their means of communication to gestures, finger-spelling, or writing.

This was first tried in a private school for deaf children near London, conducted by Miss Susanna Hull, the great pioneer of oral teaching in England (who is still living). I went to Miss Hull's school to assist her in making the experiment, and was thus introduced to what proved to be my life-work—the teaching of speech to the deaf.

In connection with this work I took up the study of the nature of the vibrations going on in the air during the utterance of speech with the object of developing an apparatus that would enable my deaf pupils to see and recognize the forms of vibration characteristic of the various elements of speech. Various instruments were devised employing loaded stretch-membranes, all based upon the well-known phonograph of Leon Scott; and these experiments paved the way for the appearance of the first membrane telephone, the ancestor of all the telephones of today.

It will thus be seen that the work of my father had a great and important influence in fitting me to grapple with the problems of the telephone. Nor should I neglect to include the influence of the important men with whom I was thrown into contact through my father's work. My father was personally acquainted with most of the men who were prominent in these lines of enquiry, and of



ALEXANDER GRAHAM BELL at the age of fifteen, from an old photograph taken at his father's country home in the suburbs of Edinburgh, Scotland.

course I, as I grew up, came to know them, too.

I recall at the present moment Alexander J. Ellis, the translator of Helmholtz; Max Muller, the Sanskrit scholar, professor of modern languages at Oxford University; Henry Sweet, the phonetician; Dr. Furnival, the secretary of the Philological Society of London; Dr. Murray, afterwards Sir James Murray, the editor of the great Oxford Dictionary; Prince Lucien Bonaparte, student of Scottish dialects; and Sir Charles Wheatstone, who is often credited, in England, with the invention of the electric telegraph.

When quite a lad I came into personal contact with these and many other prominent men. Ellis, Sweet, Furnival, and Murray I came to know very well, but most of the others I merely met casually during the course of interviews with my father.

### SIR CHARLES WHEATSTONE

I WAS also quite young when I had the opportunity of meeting Sir Charles Wheatstone. The interview at which I was present had nothing to do with electricity or the electric telegraph, but related to a very different subject altogether.

You have probably all heard of the celebrated automaton chess-player of the Baron von Kempelen, which appeared in the eighteenth century and startled all Europe by beating the most celebrated chess-players on the Continent. The story has come down to us that a dwarf was concealed in the apparatus, who guided the machinery and dictated the moves.

Many persons have imagined that the Baron's equally celebrated automaton speaking-machine, which was said to have uttered words and sentences in a childish voice, also constituted an imposition on the public; but, on the other hand, there were some grounds for believing that this might have been a real automaton after all, for the Baron von Kempelen published a book upon "The Mechanism of Human Speech," in which he gave a full description of his speaking-machine, with copious illustrations.

A copy of this book fell into the hands of Sir Charles Wheatstone, and he tested the matter by reconstructing the apparatus from the description and diagrams. My father heard of this and made an appointment with Wheatstone to see the machine and hear it talk; and he took me with him. I was too young to take any part in the conversation that ensued, but I was a silent and interested observer of all that went on.

I saw Sir Charles manipulate the machine, and heard it speak; and although the articulation was disappointingly crude, it made a great impression upon my mind. Sir Charles very kindly loaned my father the Baron von Kempelen's book and I devoured it when we reached home. It was in French, but I knew enough of French to be able, with my father's assistance, to read and enjoy the book.

Mr. Ellis expressed great interest but informed me that I had been anticipated by Helmholtz, who had not only analyzed vowel sounds into their constituent musical elements, but had actually produced vowel sounds by a synthetic process, by pitches and relative intensities. He had produced these musical tones by means of tuning-forks which were kept in vibration by an electrical current and had controlled the relative intensities by resonators applied to the forks.

At this time I knew nothing whatever about electricity, and found myself quite unable to understand, from Mr. Ellis' explanation, how tuning-forks could be made to vibrate by an electrical current.

Helmholtz' work had not then been translated into French or English

and I was unable to read it in the original German. I therefore took up the study of electricity, and began to experiment with electrical apparatus in the hope that I might ultimately be able to construct Helmholtz' vowel apparatus and repeat his experiments.

When at last after my arrival in America, I succeeded in vibrating tuning-forks and tuned plates and reeds by electrical means, I made a number of electrical inventions based upon the utilization of musical notes as telegraphic signals; and these led gradually to the invention of the telephone itself.

But I need not enlarge upon this subject here, as you are already familiar with the development of the telephonic art, and I wish to confine my remarks as much as possible to boyish incidents, with which you may not be familiar.

### PRINCE LUCIEN BONAPARTE

PRINCE Lucien Bonaparte was a distinguished scientific man, residing, I believe, in London, who made personal tours of Scotland, mapping out the geographical boundaries of the various Scotch dialects. As my father was a recognized authority upon dialects, the Prince invited him to dinner to talk over the subject, and I also was included in the invitation. I was only a boy at the time, but old enough to be duly impressed with the distinguished honor of dining with a real live prince.

I did not understand very much of the subjects of conversation, and was more impressed, I think, by the dignity and elegance of the three waiters, who stood at attention behind our three chairs. One put a plate with something on it right in front of me, and I was especially interested in the mysterious appearance of a hand the moment I let my knife or fork rest on my plate, followed by the sudden disappearance of the plate and the arrival of another.

I am afraid I was much more interested in this strange phenomenon than in the discussions that were going on between my father and the Prince. I amused myself, however, by counting the number of courses until finally I lost count. My boyhood recollection was that there were over twenty courses, but I am a little more doubtful about that now.

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much alike in our tastes and pursuits and even in our personal appearance. We were both fond of making little mechanical devices of various kinds, but we differed in our ability to construct them.

Melville was quite skillful in the use of tools and very neat-handed in everything he did. I, on the other hand, was always clumsy in the use of my hands and inefficient where tools were concerned. I hit upon a plan, however, that obviated the disadvantages of this defect in a great degree: I made my models of gutta-percha wherever possible.

This is an admirable substance to bring to a boy's attention. Gutta-percha becomes quite soft in warm water and if you are careful to keep the hands wet, to avoid sticking, you can mold it into any form desired. Upon cooling, it becomes quite hard and firm. Then, again, you can give it quite a fine finish by smoothing the surface with a hot knife.

A pencil of gutta-percha can be handled like a stick of sealing wax and can be melted or set on fire over a flame of a candle. The melted drops are quite sticky and adhere to any dry object with the firmness of glue. I used the material in place of glue. For example, in fastening pieces of wood together, I simply rubbed the adjoining surfaces with the melted end of a stick of gutta-percha and pressed them together. At once they adhered with sufficient firmness to avoid the necessity of using tacks, nails, or screws. The joint was quite firm the moment the gutta-percha cooled.

### AN ATTEMPT TO COPY NATURE

MY father took an extraordinary interest in the proposed talking-machine and encouraged us in every way. I now realize, as I could not then that he looked upon the machine as a valuable educational toy, which would compel us to become familiar with the operation of the vocal organs, quite independently of any practical results attained. This accounts for the fact that he did not encourage us to follow in the footsteps of Kempelen and Wheatstone, but rather sought to have us copy nature herself.

In accordance with his advice, we attempted to make an exact copy of the vocal organs and work the artificial lips, tongue and soft palate by means of levers controlled by a key-board.

I started out with my part of the work by making a cast from a human skull and then from this mould produced a replica of the mouth parts of the skull in gutta-percha. This gave us a firm foundation on which to build, consisting of the upper teeth, the upper gum, the hard palate, and the back of the pharynx, with a large hole at the top representing the rear entrance into the nasal cavities.

This hole was covered by a valve, consisting of a piece of wood hinged to the palate and covered with a skin of soft rubber stuffed with cotton batting. The lever to operate it passed through the nasal passage beyond the nose.

The lips were formed of a framework of iron wire covered with rubber stuffed with cotton batting, and rubber cheeks were provided which completely closed in the mouth cavity.

### A TONGUE OF WOOD DESIGNED

IT was proposed to make the tongue of wooden sections, standing side by side like the dampers of a piano, each section to be pushed up into the mouth by its appropriate lever, the whole tongue to be covered over by a thin skin of rubber stuffed with cotton batting. This part of the apparatus was never actually completed, but sections of the tongue were made and experimented with.

While I was working at this apparatus, my brother Melville succeeded in making an artificial larynx, or throat, of tin, with a flexible tube attached as windpipe. Inside the larynx were two flat sheets of tin sloping upward toward one another, but not touching in the middle. They resembled the roof of a house with the ridge-pole removed.

Stretched tightly upon this structure were two sheets of rubber the edges of which touched one another in the space where the ridge-pole should be.

My brother found, upon blowing through the windpipe, that the rubber vocal chords were thrown into vibration, producing a musical sound. By varying the tension of the rubber strips and by varying the force of the breath, he could make the thing squeak like

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# Prehistoric Telephone Days

(CONTINUED FROM PAGE 2.)

a Punch and Judy show, or produce a good, sonorous vibration like a reed musical instrument.

## THE TALKING HEAD IS ASSEMBLED AND TRIED ON THE NEIGHBORS

WHEN this stage had been reached we were, of course, anxious to put the throat and the mouth together to see what the effect would be. We could not wait for the completion of the tongue; we could not wait for the arrival of the organ bellows. My brother simply fastened his tin larynx to my gutta-percha mouth and blew through the windpipe provided.

At once the character of the sound was changed. It no longer resembled a reed musical instrument, but a human voice. Vowel quality, too, could be detected, and it really seemed as though some one were singing the vowel "ah."

I then closed and opened the rubber lips a number of times in succession, while my brother blew through the windpipe. The machine at once responded by uttering the syllables "ma-ma-ma-ma," etc., quite clearly and distinctly. By using only two syllables and prolonging the second, we obtained a quite startling reproduction of the word "mamma," pronounced in the British fashion, with the accent on the second syllable.

Well, of course, boys will be boys, and we determined to try the effect upon our neighbors.

My father's house in Edinburgh was one of a number of houses and flats that opened upon a common stair. We took the apparatus out on the common stair and made it yell! My brother put the windpipe to his mouth and blew for all he was worth, while I manipulated the lips. Soon the stairway resounded with the most agonizing cries of "Mamma! Mamma! Mamma!" It really sounded like a little child in great distress calling for its mother.

Presently a door opened upstairs and we heard a lady exclaim, "My goodness, what's the matter with that baby?"

That was all that was necessary to complete our happiness. Delighted with our success, we stole quietly back into my father's house and gently shut the door, leaving the poor lady to make a fruitless search for the now silent child.

I do not think that the speaking-machine progressed very far beyond this point; but it had undoubtedly been successful in realizing my father's desire that through its means his boys should become thoroughly familiar with the actual instrument of speech and the functions of the various vocal organs.

In order to show the educational value of the apparatus, allow me to speak of some of the difficulties experienced in making the larynx. It was easy enough for my brother to copy the external appearance of the larynx, but we both found that our ideas concerning the interior arrangements were vague and extremely hazy. We were thus forced to consult books of reference and anatomical drawings, and we also examined a papiermache model of the human larynx.

## KILLING A CAT IN THE INTEREST OF SCIENCE

EVEN with these aids we were greatly puzzled by the appearance of the vocal chords. They did not at all resemble "cords" or tightly stretched strings, as we had imagined, and we felt that the only way of completely clarifying our ideas would be to examine the interior of a real larynx. This, however, involved a visit to a dissecting room and the examination of a dead human body. We were only boys, and shrank with horror from the mere idea of attempting to do this.

We then remembered that we knew of an animal that produced sounds greatly resembling the human voice, especially at night, and wondered whether the throat might not resemble the human larynx. We desired to see, so at last we determined to kill a cat in the interests of science. The only trouble was that we were much too tender-hearted to perform the operation ourselves.

We therefore sought the assistance of a friend, a young man who was a medical student and therefore presumably accustomed to deeds of blood. Would he not kill the cat for us, in the most approved and painless fashion and without injuring that precious organ the larynx.

He undertook the job, and so we caught a cat and carried it into my father's greenhouse at Trinity, near Edinburgh. My brother and I held the legs while the medical student forced open the mouth and quickly poured in a liquid warranted to send the cat to sleep. When I tell you that the liquid was nitric acid, you may imagine that that was not the result.

With a single bound the creature was out of our hands and rushing frantically round and round the greenhouse in the greatest agony. I shall never forget the thrill of horror that seized me, as I realized the condition of affairs. It was some time before the poor creature could be caught and put out of its misery; by which time we had completely lost our appetite for dissection. We quietly buried the cat and never even looked at the vocal organs.

It took us quite a long time to

recover from the nervous shock of witnessing so terrible a death; but our medical friend — or, rather, fiend — merely laughed. He thought he had played a good joke upon us.

After this we were satisfied to obtain our knowledge of the larynx from a lamb's throat supplied by a butcher.

## TEACHING THE DOG TO SPEAK

I was always much interested in my father's examinations of the mouths of his elocutionary pupils. They differed in an extraordinary degree in size and shape, and yet all these variations seemed to be quite consistent with perfect speech. I then began to wonder whether there was anything in the mouth of a dog to prevent it from speaking, and commenced to make experiments with an intelligent Skye terrier we possessed.

By the application of suitable doses of food material, the dog was soon taught to sit up on his hind legs and growl continuously while I manipulated his mouth, and stop growling when I took my hands away. I took his muzzle in my hands and opened and closed the jaws a number of times in succession. This resulted in the production of the syllables "ma-ma-ma-ma," etc., as in the case of the talking-machine.

The mouth proved to be too small to enable me to manipulate individual parts of the tongue, but upon pushing upward between the bones of the lower jaw, near the throat, I found it possible to completely close the passageway at the back of the mouth, and a succession of pushes of this character resulted in the syllables "ga-ga-ga-ga," etc.

The simple growl was an approximation of the vowel "ah," and this, followed by a gradual constriction and "rounding" of the labial orifice by the hand, became converted into the diphthong "ow," as in the word "how" (ah-oo), and we soon obtained the final element by itself—an imperfect "oo." The dog's repertoire of sounds finally consisted of the vowels "ah" and "oo," the diphthong "ow," and the syllables "ma" and "ga."

We then proceeded to manufacture words and sentences composed of these elements, and the dog's final linguistic accomplishment consisted in the production of the sentence "Ow-ah-oo-gamama," which, by the exercise of a little imagination, readily passed muster for "How are you, grandmamma." "Ow-ah-oo-ga-mama")?"

## THE DOG TRIES IN VAIN TO TALK UNAIDED.

THE dog soon learned that his business in life was to growl while my hands were upon his mouth, and to stop growling the moment I took them away, and we both of us became quite expert in the production of the famous sentence, "How are you, grandmamma?"

The dog took quite a bread-and-butter interest in the experiment and often used to stand up on his hind legs and try to say this sentence by himself, but without manipulation was never able to do anything more than growl.

The fame of the dog soon spread among my father's friends, and people came from far and near to witness the performance. This is the only foundation for the newspaper stories that I had once succeeded in teaching a dog to speak.

## MY FIRST INVENTION.

I HAVE often been asked whether I can recall the nature of my first invention and how I came to make it. So far as I can recollect, it came about in this way:

When I was quite a little fellow, it so happened that my father had a pupil of about my own age with whom I used to play. He was the son of a Mr. Herdman, who owned large flour mills near Edinburgh, and, of course, I went over to the mills pretty often to play with him there. We romped about and got into all sorts of mischief, until at last one day Mr. Herdman called us into his office for a very serious talk.

"Why can't you boys do something useful," he said, "instead of always getting into mischief?" I mildly asked him to tell us some useful thing to do, and he replied by putting his arm into a bag and pulling out a handful of wheat. He showed us that the grains were covered with husks, and said: "If you could only take the husks off that wheat you'd be doing something useful indeed."

That made rather an impression upon my mind, and I began to think, "Why couldn't we take the husks off by brushing the seeds with a nailbrush?" We tried the experiment and found it successful, although it involved a good deal of hard work from the two mischief-makers. We persevered, however, and soon had a nice little sample of cleaned wheat to show Mr. Herdman. I then remembered that during our explorations at the mills we had come across a large vat or tank with a paddle-wheel arrangement in it that whirled round and round in a casing of quite rough material, brushes or fine wire netting, or something of that sort. If we could only put the wheat into that machine, I thought, the whirling of the paddle should cause the seeds to rub against the rough surface of the casing, and thus brush off the husks.

It was a proud day for us when we boys marched into Mr. Herdman's office, presented him with our sample of cleaned wheat and suggested pudding wheat in the dried-out vat. "Why," said Mr. Herdman, "that's quite a good idea," and he immediately ordered the experiment to be made. It was successful and the process, I understand, or a substantially similar one, has been carried on at the mills ever since.

In 1876 about the time when the telephone became known to the world through the Centennial Exhibition, I had in my classes at the Boston University a Japanese student named Issawa. He afterwards became the Japanese Minister of Education in Formosa, and he is still living, I believe as a member of the House of Peers.

## JAPANESE WAS THE FIRST FOREIGN LANGUAGE SPOKEN BY TELEPHONE

MR. Issawa was studying with me the pronunciation of English and how the English sounds differed from the Japanese elements of speech. He knew of this curious instrument I had invented and one day he fairly startled me with a question about it. "Mr. Bell," he said, taking the telephone up in his hand, "will this thing talk Japanese?"

He seemed much surprised when

I assured him that it would talk any language, and he immediately proceeded to try it. He spoke into the transmitter while I listened at the receiver. I reported that the telephone was undoubtedly talking Japanese, but unfortunately I could neither speak nor understand the language myself.

He then asked whether he might bring two Japanese friends who were students at Harvard College. They came and soon satisfied themselves that the instrument could be used in Japan.

A great many years afterwards I was in Yokohama when the American residents there were entertaining a new Japanese minister who was about to start for Washington. I attended the banquet and was about to be presented to the minister, when he came forward and said that there was no necessity for introducing him to Mr. Bell, as he knew me years and years ago, when he was a student at Harvard College. He turned out to be one of Mr. Issawa's friends who had been present when Japanese was first used over the telephone.

This was the celebrated Baron Kurino, who was Japan's representative at Washington for some years and afterwards became Premier of Japan and represented his country during the peace negotiations at Portsmouth, New Hampshire, at the conclusion of the Russo-Japanese War.

A few years ago a well-known Japanese gentleman visited the United States in a semi-official capacity to cultivate good relations between America and Japan. He gave a lecture before the National Geographic Society in Washington and as I happened to be the President of the Society at the time, I entertained the distinguished visitor at dinner. This was Baron Kinoko, who is now, I believe, revisiting America on a similar mission.

The Baron in his after-dinner speech remarked that this was not the first time he had met Mr. Bell for he was one of the two students from Harvard College who had spoken through the telephone in 1876.

It is rather interesting to know, not only that Japanese was the first foreign language spoken by telephone, but that the speakers were among the foremost men that Japan had produced.

The telephone has gone all over the world since then. It has grown far beyond my knowledge. The telephone system, as we know it, is the

product of many, many minds, to whom honor should be given for the wonderful and beneficial work it has accomplished. I can only say I am proud and thankful of the fact that it was my crude telephone of 1874-75 that originated the great industry that we see today, and I hope that you have been interested in hearing something of its prehistoric days.